

Remarks/Arguments

Summary

By this Amendment, claims 1, 12 and 13 have been revised, claim 2 has been canceled, and new claims 20-21 have been added.

Accordingly, claims 1 and 3-21 are now pending in the application.

Claim Objections

By this Amendment, claim 12 has been revised to correct the typographical error identified by the Examiner.

Double Patenting

Independent claim 1 and dependent claims 12, 14, 17 and 18 were rejected under the judicially created doctrine of obviousness-type doubling patenting over claims of U.S. Patent No. 6,544,858. However, this rejection has been rendered moot by the incorporation of the subject matter of claim 2 into independent claim 1.

35 U.S.C. ¶102 – Tsukune et al. (claims 1-3, 14, 17-19)

Claims 1-3, 14 and 17-19 were rejected under 35 U.S.C. ¶102 as being anticipated by Tsukune et al. (US 5314724). However, Applicants respectfully contend that the amended claim 1 and dependent claims 3, 14 and 17-19 define over the Tsukune et al. reference, and in view of the following representations, reconsideration of the rejection under 35 U.S.C. ¶102 is requested.

As can be seen in Figure 6 of the present application, organics are clearly retained in the film subjected to the process of amended claim 1. In contrast, Tsukune indicates that all carbon is to be removed. Tsukune is in fact aiming to produce a silicon dioxide

film (which normally has a dielectric constant of 3.9) which can be deposited in a flowable way. In contrast, the method of claim 1 results in an organic film, and as recited in dependent claim 14, the organic film may have a dielectric constant of less than 3.

For at least these reasons, Applicants respectfully contend that claim 1 and the claims dependent thereon are not anticipated by Tsukune.

35 U.S.C. §102 – Beekman et al. (claims 1-3, 12, 14, 17-19)

Claims 1-3, 12, 14 and 17-19 were rejected under 35 U.S.C. §102 as being anticipated by Beekman et al. (WO 98/08249). However, Applicants respectfully contend that the amended claim 1 and dependent claims 3, 12, 14 and 17-19 define over the Beekman et al. reference, and in view of the following representations, reconsideration of the rejection under 35 U.S.C. §102 is requested.

In the rejection, the Examiner has not addressed the limitation of original claim 2 (now found in independent claim 1). In fact, Beekman et al. does not teach that the plasma should be hydrogen nor indeed that the wafer should be heated and subjected to plasma treatment. For at least these reasons, Applicants contend that claim 1 and the claims dependent thereon are not anticipated by Beekman et al.

35 U.S.C. §102 – Makita et al. (claims 1-3, 14, 18, 19)

Claims 1-3, 14, 18 and 19 were rejected under 35 U.S.C. §102 as being anticipated by Makita et al. (US 5619044). However, Applicants respectfully contend that the amended claim 1 and dependent claims 3, 14, 18 and 19 define over the Makita et al. reference, and in view of the following representations, reconsideration of the rejection under 35 U.S.C. §102 is requested.

The Examiner refers to the first paragraph in column 17 Makita which talks about

forming a silicon oxide film, which is then etched and metalized prior to the final annealing using a hydrogen plasma atmosphere. The Examiner then leaps back several examples to the bottom of column 12 to show that silicon oxide might be formed using TEOS and oxygen or ozone and he assumes the presence of carbon. In other words the Examiner is plucking bits from different examples within the specification and combining them in a way which is not taught.

In any event, Makita does not teach the limitations of amended claim 1, which includes heating the polymer layer to desorb moisture and harden the layer and exposing the layer to a hydrogen plasma during the heating process, where the polymer layer includes carbon subsequent to the heating and exposing.

35 U.S.C. ¶102 – Li (claims 1, 3-12, 14, 17-19)

Claims 1, 3-12, 14 and 17-19 were rejected under 35 U.S.C. ¶102 as being anticipated by Li (US 6383951). However, this rejection has been rendered moot by the incorporation of the subject matter of claim 2 into independent claim 1.

35 U.S.C. ¶103 – Li in view of Makita et al. (claims 2, 13)

Claims 2 and 13 were rejected under 35 U.S.C. ¶103 as being obvious over Li in view of Makita et al. However, Applicants respectfully contend that the amended claim 1 and dependent claim 13 define over the combination of Li and Makita et al., and in view of the following representations, reconsideration of the rejection under 35 U.S.C. ¶103 is requested.

The Examiner accepts that Li does not specify hydrogen plasma, and contends that it would be obvious to overcome this omission in Li based upon the teachings of Makita. However, one of ordinary skill would not combine these references in the fashion suggested by the Examiner. The plasma treatment of Li is described as one

which does not deposit an appreciable layer over the silicon hydroxide layer, so it would seem that the intention is not to affect the nature of the surface, but rather, as indicated at lines 4 to 10 in column 6, to drive out water from the layer. The Examiner's argument seems to be that Makita teaches that the hydrogen treatment is good for terminating dangling bonds and therefore it would be obvious to substitute the use of hydrogen in the Li process. Applicants disagree, because Li indicates that he does not want to deposit on to the surface; what he wants to do is drive out water.

For at least these reasons, Applicants contend that claim 1 and the claims dependent thereon are not obvious in view of the combined teachings of Li and Makita et al.

35 U.S.C. ¶103 – Li (claims 15-16)

Claims 15-16 were rejected under 35 U.S.C. ¶103 as being obvious over Li. However, this rejection has been rendered moot by the incorporation of the subject matter of claim 2 into independent claim 1. In addition, Applicants note that Li teaches that the treatment thereof should not be more than 90 seconds (which is not surprising, because a more aggressive plasma treatment would be very likely to attack the carbon bonds he seeks to maintain). It would not be obvious to modify Li to achieve the depths of treatment of claims 15 and 16.

New Claims

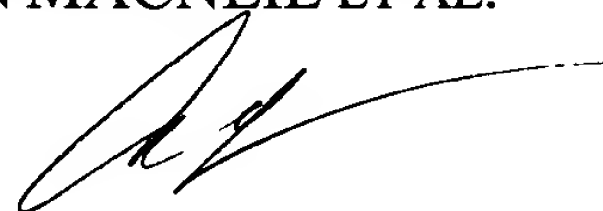
New claims 20-21 include the limitations of amended claim 1, and for at least the reasons stated above, it is believed that these new claims define over the cited references.

Conclusion

No other issues remaining, reconsideration and favorable action upon the claims 1 and 3-21 now pending in the application are requested.

Respectfully submitted,

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